



6560-50-P

**ENVIRONMENTAL PROTECTION AGENCY**

**40 CFR Part 98**

**[EPA-HQ-OAR-2011-0512; FRL-9633-5]**

**RIN 2060-AR09**

**Greenhouse Gas Reporting Program: Electronics Manufacturing:**

**Revisions to Heat Transfer Fluid Provisions**

**AGENCY:** Environmental Protection Agency (EPA).

**ACTION:** Final rule.

**SUMMARY:** The EPA is finalizing technical revisions to the electronics manufacturing source category of the Greenhouse Gas Reporting Rule related to fluorinated heat transfer fluids. More specifically, EPA is finalizing amendments to the definition of fluorinated heat transfer fluids and to the provisions to estimate and report emissions from fluorinated heat transfer fluids. This final rule is narrow in scope and does not address any other changes related to the electronics manufacturing source category.

**DATES:** This rule will be effective on [INSERT THE DATE 30 DAYS AFTER THE DATE OF PUBLICATION OF THE FINAL RULE IN THE FEDERAL REGISTER].

**ADDRESSES:** The EPA has established a docket for this action under Docket ID No. EPA-HQ-OAR-2011-0512. All documents in the docket are listed in the <http://www.regulations.gov> index.

Although listed in the index, some information may not be publicly available, e.g., confidential business information (CBI) or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, is not placed on the Internet and is publicly available in hard copy only. Publicly available docket materials are available either electronically through <http://www.regulations.gov> or in hard copy at the EPA's Docket Center, EPA/DC, EPA West Building, Room 3334, 1301 Constitution Ave., NW, Washington, DC. This Docket Facility is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566-1744, and the telephone number for the Air Docket is (202) 566-1742.

**FOR FURTHER INFORMATION CONTACT:** Carole Cook, Climate Change Division, Office of Atmospheric Programs (MC-6207J), Environmental Protection Agency, 1200 Pennsylvania Ave., NW., Washington, DC 20460; telephone number: (202) 343-9263; fax number: (202) 343-2342; email address: [GHGReportingRule@epa.gov](mailto:GHGReportingRule@epa.gov). For technical information and implementation materials, please go to the website <http://www.epa.gov/climatechange/emissions/subpart/i.html>. To submit a question, select "Rule Help Center," followed by "Contact Us."

Worldwide Web (WWW). In addition to being available in Docket ID No. EPA-HQ-OAR-2011-0512, following the Administrator's signature, an electronic copy of this final rule will also be available through the WWW on the EPA's Greenhouse Gas Reporting Program website at <http://www.epa.gov/climatechange/emissions/ghgrulemaking.html>.

**SUPPLEMENTARY INFORMATION:**

Regulated Entities. The Administrator determined that this action is subject to the provisions of Clean Air Act (CAA) section 307(d). These amended regulations could affect owners or operators of certain electronic manufacturing facilities. Regulated categories and entities may include those listed in Table 1 of this preamble:

**Table 1. Examples of Affected Entities by Category**

Source Category	NAICS	Examples of affected facilities
<b>Electronics Manufacturing</b>	334111	Microcomputers manufacturing facilities.
	334413	Semiconductor, photovoltaic (solid-state) device manufacturing facilities.
	334419	Liquid Crystal Display (LCD) unit screens manufacturing facilities.
	334419	Micro-electro-mechanical systems (MEMS) manufacturing facilities.

Table 1 of this preamble is not intended to be exhaustive, but rather provides a guide for readers regarding facilities likely to be affected by this action. Table 1 of this preamble lists the types of facilities of which the EPA is aware could be

potentially affected by the reporting requirements. Other types of facilities not listed in the table could also be affected. To determine whether you are affected by this action, you should carefully examine the applicability criteria found in 40 CFR part 98, subpart A and 40 CFR part 98, subpart I. If you have questions regarding the applicability of this action to a particular facility, consult the person listed in the preceding **FOR FURTHER INFORMATION CONTACT** section.

Judicial Review. Under CAA section 307(b)(1), judicial review of this final rule is available only by filing a petition for review in the U.S. Court of Appeals for the District of Columbia Circuit (the Court) by [INSERT THE DATE 60 DAYS AFTER THE DATE OF PUBLICATION OF THE FINAL RULE IN THE FEDERAL REGISTER]. Under CAA section 307(d)(7)(B), only an objection to this final rule that was raised with reasonable specificity during the period for public comment can be raised during judicial review. Section 307(d)(7)(B) of the CAA also provides a mechanism for the EPA to convene a proceeding for reconsideration, "[i]f the person raising an objection can demonstrate to EPA that it was impracticable to raise such objection within [the period for public comment] or if the grounds for such objection arose after the period for public comment (but within the time specified for judicial review) and if such objection is of central relevance to the outcome of the

rule." Any person seeking to make such a demonstration to us should submit a Petition for Reconsideration to the Office of the Administrator, Environmental Protection Agency, Room 3000, Ariel Rios Building, 1200 Pennsylvania Ave., NW., Washington, DC 20460, with a copy to the person listed in the preceding **FOR FURTHER INFORMATION CONTACT** section, and the Associate General Counsel for the Air and Radiation Law Office, Office of General Counsel (Mail Code 2344A), Environmental Protection Agency, 1200 Pennsylvania Ave., NW., Washington, DC 20004. Note that under CAA section 307(b)(2), the requirements established by this final rule may not be challenged separately in any civil or criminal proceedings brought by the EPA to enforce these requirements.

Acronyms and Abbreviations. The following acronyms and abbreviations are used in this document.

CAA	Clean Air Act
CARB	California Air Resources Board
CBI	confidential business information
CFR	Code of Federal Regulations
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> e	CO <sub>2</sub> -equivalent
EPA	U.S. Environmental Protection Agency
FR	Federal Register
GHG	greenhouse gas
GHGRP	Greenhouse Gas Reporting Program
GWP	global warming potential
HTF	heat transfer fluid

ICR	information collection request
mm Hg	millimeters of mercury
MSDS	Material Safety Data Sheets
mtCO <sub>2</sub> e	metric tons CO <sub>2</sub> -equivalent
N <sub>2</sub> O	nitrous oxide
NAICS	North American Industry Classification System
NF <sub>3</sub>	nitrogen trifluoride
NTTAA	National Technology Transfer and Advancement Act
OMB	Office of Management and Budget
QA/QC	quality assurance/quality control
RFA	Regulatory Flexibility Act
SBA	Small Business Administration
SBREFA	Small Business Regulatory Enforcement and Fairness Act
U.S.	United States
UMRA	Unfunded Mandates Reform Act of 1995
U.S.C.	United States Code

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## **I. Background**

### A. Organization of This Preamble

This preamble consists of four sections. The first section provides a brief history of 40 CFR part 98, subpart I (hereinafter referred to as "subpart I").

The second section of this preamble summarizes the revisions made to specific requirements for subpart I being incorporated into 40 CFR part 98 (hereinafter referred to as "Part 98") by this action and the EPA's rationale for those changes. The amendments finalized in this action reflect the changes to subpart I proposed on September 9, 2011 (76 FR 56010), with some additional clarifications. This section also presents a summary of, and EPA's responses to, the major public comments submitted on the proposed rule amendments, and significant changes, if any, made since proposal in response to those comments.

The third section of this preamble provides a discussion regarding the economic impacts of this final rule. Finally, the last section discusses the various statutory and executive order requirements applicable to this rulemaking.

#### B. Background on the Final Rule

This action finalizes amendments to provisions in 40 CFR part 98, subpart I. The EPA published subpart I: Electronics Manufacturing of the Greenhouse Gas Reporting Program (GHGRP) on December 1, 2010 (75 FR 74774) in the Federal Register. Subpart I of the GHGRP requires monitoring and reporting of GHG emissions from electronics manufacturing facilities that have yearly emissions equal to or greater than 25,000 mtCO<sub>2</sub>e.

Following the publication of subpart I in the Federal Register, 3M Company (3M) sought EPA reconsideration of the final rule requirements for reporting fluorinated heat transfer fluids (HTFs). Subsequently, EPA published a proposal to amend provisions in subpart I related to calculating and reporting fluorinated HTFs to reflect the agency's intent to require reporting of all fluorocarbons (except for ozone depleting substances regulated under EPA's Stratospheric Protection Regulations at 40 CFR part 82) that can enter the atmosphere under the conditions in which fluorinated HTFs are used in the electronics manufacturing industry.



The proposal was published on September 9, 2011 (76 FR 56010). The public comment period for the proposed rule amendments initially was scheduled to end on October 11, 2011. The EPA received a request to extend the public comment period and published a notice in the Federal Register on October 4, 2011 (76 FR 61293) extending the public comment period to October 24, 2011.

In this action, the EPA is finalizing amendments to provisions in subpart I that were proposed in the September 9, 2011 action with some additional clarifications. Responses to comments submitted on the proposed amendments can be found in Section II of this preamble. Note that the agency is not requiring reports filed in September 2012 for reporting year 2011 to cover emissions of newly included fluorinated HTFs.

#### C. Legal Authority

The EPA is promulgating these rule amendments under its existing CAA authority, specifically authorities provided in CAA section 114.

As stated in the preamble to the 2009 final Greenhouse Gas Reporting Rule (74 FR 56260, October 30, 2009), CAA section 114 provides the EPA broad authority to require the information mandated by Part 98 because such data would inform and are relevant to the EPA's obligation to carry out a wide variety of CAA provisions. As discussed in the preamble to the initial

proposal (74 FR 16448, April 10, 2009), CAA section 114(a)(1) authorizes the Administrator to require emissions sources, persons subject to the CAA, manufacturers of process or control equipment, and persons whom the Administrator believes may have necessary information to monitor and report emissions and provide such other information the Administrator requests for the purposes of carrying out any provision of the CAA. For further information about the EPA's legal authority, see the preambles to the proposed and final rule, and related Response to Comments Documents.

D. How Confidential Business Information Determinations and the Deferral of Inputs to Emission Equations are Affected by Today's Action

The EPA finalized several rulemakings in 2011 in response to concerns related to the reporting and publication of information that may be considered CBI.

On May 26, 2011, the EPA promulgated confidentiality determinations for certain data elements required to be reported under Part 98 and finalized amendments to the Special Rules Governing Certain Information Obtained Under the Clean Air Act, which authorizes the EPA to release or withhold as confidential reported data according to the confidentiality determinations for such data without taking further procedural steps (76 FR

30782, hereinafter referred to as the "May 26, 2011 Final CBI Rule").

On August 25, 2011, the EPA published a final rule that deferred the reporting deadline for data elements that are used by direct emitter reporters, including those under subpart I, as inputs to emission equations under the Mandatory Greenhouse Gas Reporting Rule (76 FR 53057). In that final rule, the EPA deferred the deadline for reporting subpart I inputs to emission equations based on the 2010 final rules for 40 CFR part 98, subpart I (75 FR 74774, December 1, 2010). With respect to the subject of today's rule, emissions of fluorinated HTFs, the EPA deferred the deadline for reporting inputs to the fluorinated HTF mass balance equation (Equation I-16) as required in 40 CFR 98.95(r) until March 31, 2015 and those elements have not changed as a result of today's final rule.

The May 26, 2011 Final CBI Rule only addressed reporting of data elements in 34 subparts that were determined not to be inputs to emission equations and, therefore, were not proposed to have their reporting deadline deferred. Furthermore, that rule also did not make confidentiality determinations for eight subparts, including subpart I, for which reporting requirements were finalized after the publication of the CBI proposals (July 7, 2010 CBI proposal at 75 FR 39094 and July 27, 2010 supplemental proposal at 75 FR 43889).

Instead, on January 10, 2012 (77 FR 1434), the EPA proposed CBI determinations for non-inputs data elements from six of the eight subparts not included in the 2010 rulemakings. CBI determinations for the non-inputs data elements of the two remaining subparts, subpart I and subpart W, are being addressed in separate actions.

As stated above, the EPA intends to propose and finalize CBI determinations for subpart I (both non-inputs and inputs to emissions equations) in separate actions. The agency's goal is to finalize CBI determinations for the non-inputs before the deadline for reporting 2011 data (September 28, 2012).

With respect to the two new subpart I reporting requirements finalized today (40 CFR 98.96(u) and (v)) discussed in detail in Section II.A of this preamble, these are not inputs to emissions equations and EPA is planning to finalize CBI determinations for these two data elements in separate actions prior to the deadline for reporting these data elements to the EPA. For more information generally on the various actions related to treatment of data that may be considered CBI, please see the GHGRP website dedicated to CBI at <http://www.epa.gov/climatechange/emissions/CBI.html>.

## **II. Overview of Amendments to the Electronics Manufacturing**

### **Source Category**

A. Summary of Final Amendments to the Electronics Manufacturing  
Source Category

In this action, the EPA is finalizing amendments to subpart I regarding the calculation and reporting of emissions of fluorinated HTFs. More specifically, the EPA is finalizing the changes to the definition of fluorinated HTFs and to the provisions to estimate and report emissions of fluorinated HTFs that were proposed on September 9, 2011 (76 FR 56010), with the following five refinements.

- In the definition of fluorinated HTFs, the EPA is specifically excluding select applications of fluorinated chemicals. These applications include their uses as lubricants (such as greases and oils), and surfactants.
- Where a fluorinated chemical is used in both HTF and non-HTF applications, the EPA is providing flexibility to allow facilities to estimate either that chemical's emissions from all applications or its emissions from only the applications included in the fluorinated HTF definition.
- To accommodate the change in the definition of fluorinated HTF, the EPA is amending 40 CFR 98.94(h)(3), which requires facilities to ensure that the inventory of fluorinated HTFs at the beginning of the reporting year is identical to the inventory recorded at the end of the previous reporting year. Specifically, EPA is adding an exception to this requirement to allow for differences between the beginning and end-of-year inventories that are solely attributable to the change in the scope of subpart I. In addition, EPA is clarifying that 40 CFR 98.94(h) applies to each fluorinated HTF just as it applies to each fluorinated GHG and nitrous oxide (N<sub>2</sub>O).
- The EPA is adding two new reporting requirements to reflect flexibilities being added to the rule that are described above.
  - a. First, related to the flexibility provision discussed in the second bulleted paragraph above, the EPA is requiring facilities to report to the EPA whether they

estimated and reported fluorinated HTF emissions from all applications or only from those covered by the definition of fluorinated HTFs (see 40 CFR 98.96(u)).

- b. Second, for reporting year 2012 only, the EPA is requiring that facilities report the date on which monitoring of the newly included fluorinated HTFs began (see 40 CFR 98.96(v)). As discussed in the paragraphs below, for 2012, facilities will have the option to begin accounting for the newly included fluorinated HTFs on the first day of the year, January 1, 2012, or on the date that the final rule becomes effective.

The EPA is requiring facilities to estimate emissions of newly included fluorinated HTFs beginning in 2012 and to file reports that cover such emissions beginning in 2013 for the 2012 reporting year. The Agency is not requiring reports filed in September 2012 for reporting year 2011 to cover emissions of newly included fluorinated HTFs. For reporting year 2012 only, the EPA is allowing facilities to determine whether they wish to begin to estimate emissions of newly included fluorinated HTFs on January 1, 2012 or [INSERT THE DATE 30 DAYS AFTER THE DATE OF PUBLICATION OF THE FINAL RULE IN THE FEDERAL REGISTER]. In other words, facilities may calculate and report emissions of newly included fluorinated HTFs either for the time-period of January 1, 2012 through December 31, 2012 or for the time period of [INSERT THE DATE 30 DAYS AFTER THE DATE OF PUBLICATION OF THE FINAL RULE IN THE FEDERAL REGISTER] through December 31, 2012. Beginning in 2013, facilities will be required to calculate and report emissions from all fluorinated HTFs for the entirety of the reporting year (i.e., January 1 through December 31).

The EPA does not expect that facilities will have any difficulty beginning to estimate emissions of newly included fluorinated HTFs on either January 1, 2012 or [INSERT THE DATE 30 DAYS AFTER THE DATE OF PUBLICATION OF THE FINAL RULE IN THE FEDERAL REGISTER]. In summary, as finalized in the December 2010 final rule (75 FR 74774), the subpart I provisions for estimating and reporting emissions of fluorinated HTFs require a simple mass balance methodology where the facility is required to track inventories at the beginning and end of the year, acquisitions and disbursements of fluorinated HTFs, and the nameplate capacity of only newly installed and removed equipment containing fluorinated HTFs.

B. Summary of Comments and Responses Submitted on the Electronics Manufacturing Source Category

The EPA received comments from two entities. In general, one commenter supported the EPA's proposed changes to the definition of fluorinated HTFs, and the other commenter, while not objecting in principle to including high global warming potential (GWP) HTFs in subpart I irrespective of their vapor pressure, argued that the proposed definition of fluorinated HTFs is overly broad and suggested changes to narrow it. The second commenter also had a number of comments requesting that the set of fluorinated chemicals and applications included in Part 98 be narrowed. As discussed below, EPA has concluded that

these broader comments are outside the scope of this rule. However, it is important to note that the Agency is open to considering any of these broader issues, as appropriate, in future actions.

The Agency further notes that many of the chemicals for which exemptions were requested are likely excluded from Part 98, because they are used in applications that fall outside the definition of fluorinated heat transfer fluid or fluorinated GHG. The 1 millimeter mercury (mm Hg) vapor pressure at 25 °C limit remains in effect for fluorinated chemicals that are used in applications outside of the definition of fluorinated heat transfer fluid. Therefore, the EPA concluded the change to the definition of heat transfer fluid defined in this rule is sufficient to provide the necessary exclusions. All comments are summarized and addressed in more detail below.

#### Definition of Heat Transfer Fluids

Comment: One commenter supported the proposed changes to subpart I that amended the definition of HTFs. The commenter stated that the changes will result in more comprehensive reporting of HTFs, including those with high GWP.

Another commenter asserted that the EPA's proposed definition for HTFs is overly broad and argued that it includes applications that do not involve heat transfer, such as cleaning processes. The commenter stated that the proposed language fails



to distinguish between de minimis sources of emissions within a facility and between production and non-production operations. The commenter asserted that tracking substances that are not used in "heat transfer" applications would be extremely burdensome and that given their design and intended use, the materials are expected to generate insignificant emissions. The commenter argued that eliminating the vapor pressure cutoff and finalizing a definition of HTFs that includes applications that do not involve "heat transfer" would exacerbate these issues. The commenter suggested several revisions to the proposed definitions of HTF and fluorinated GHG to narrow the scope of those definitions.

First, the commenter, in response to EPA's request for comment in this issue, strongly supported the exclusion of greases, oils, and lubricants from the definition of HTFs, and suggested the definition be modified to explicitly exclude these applications. The commenter agreed with the EPA's statement that these "applications do not typically occur at temperatures at which lubricants would volatilize," and further argued that for greases, oils, and lubricants to serve their primary purpose, it is necessary that they not volatilize. In addition, the commenter stated that: (1) These materials are used within systems that must be designed to prevent leaks; (2) greases, oils, and lubricants are essential for equipment functioning;

and (3) the loss of a lubricant may result in equipment damage. The commenter concluded that these substances are unlikely to be emitted into the atmosphere in the semiconductor manufacturing process and argued they are used in small quantities.

This commenter also supported explicitly excluding fluorinated surfactants from subpart I HTF consumption and emission reporting requirements. The commenter noted that fluorinated surfactants may be added to lithography chemical formulations and aqueous polishing slurries, among other things. The commenter explained that fluorinated surfactants are added in minimal quantities (concentrations are typically around a fraction of a percent) and that they are designed to remain in solution to be effective. For this reason, the commenter argued, the potential for surfactant emissions is very limited. The commenter also stated that the identity of surfactants may be highly proprietary and in some cases not disclosed on Material Safety Data Sheets (MSDS). The commenter provided several MSDS to support their suggested explicit exclusions of oils, greases, lubricants, and surfactants.

To address the issues mentioned above, the second commenter recommended that the definition of HTFs and fluorinated GHGs be modified. Specifically, the commenter suggested that EPA only include the concept of substances used "solely or primarily to transfer heat by radiation, conduction, convection or a

combination of these methods" in the definition of HTFs. The commenter also suggested that the definition of fluorinated GHGs in subpart A explicitly exclude greases, oils, lubricants, polymers, and surfactants whose primary purpose is not heat transfer. The commenter concluded that these changes would clarify the EPA's intent not to encompass other, non-heat transfer fluorinated materials.

Response: The EPA agrees with the first commenter that the revised definition of fluorinated HTFs will result in more comprehensive reporting of high-GWP HTF emissions, as the EPA originally intended. With respect to the comment that the EPA should exclude specific applications from the definition, the EPA acknowledges that it may be helpful to explicitly exclude some applications from the definition of fluorinated HTFs that it did not intend to capture; these applications include uses as lubricants (such as greases and oils) and surfactants. While the EPA continues to interpret the proposed definition of fluorinated HTFs to already exclude these applications (because it did not specifically list them), the agency has determined that explicitly excluding them may further clarify the definition. The EPA agrees with the commenter that these applications typically occur under conditions where the substances would not volatilize and would not result in atmospheric emissions. The EPA concluded the change to the

definition of heat transfer fluid is sufficient to provide the necessary exclusions and ensure that chemicals such as lubricants and embedded solid polymers are not covered.

The EPA is not explicitly excluding "polymers" because it is not specifically an application. As explained above, in response to the comments, EPA added exclusions to the definition of HTF based on applications. The EPA acknowledges that, in many cases, fluorocarbon polymers are solids at room temperature and will not meet the definition of a fluorinated HTF. Polymers with vapor pressures well below 1 mm Hg absolute at 25 °C are unsuitable for use in the applications included in the definition of fluorinated HTF (e.g., because its melting point or viscosity is too high). Moreover, it will not otherwise be subject to subpart I because, with a vapor pressure below 1 mm Hg absolute at 25 °C, it will not meet the definition of a fluorinated GHG. On the other hand, if a polymer is used in applications included in the definition of fluorinated HTF, it is likely to be used under conditions (e.g., high temperatures) where emissions may occur. The definition of fluorinated HTF will appropriately include the polymer under these circumstances.

In this final rule, the EPA is finalizing the following definition of fluorinated heat transfer fluids: "Fluorinated heat transfer fluids means fluorinated GHGs used for temperature

control, device testing, cleaning substrate surfaces and other parts, and soldering in certain types of electronics manufacturing production processes. Fluorinated heat transfer fluids do not include fluorinated GHGs used as lubricants or surfactants. For fluorinated heat transfer fluids under this subpart I, the lower vapor pressure limit of 1 mm Hg in absolute at 25 °C in the definition of Fluorinated greenhouse gas in 40 CFR 98.6 shall not apply. Fluorinated heat transfer fluids used in the electronics manufacturing sector include, but are not limited to, perfluoropolyethers, perfluoroalkanes, perfluoroethers, tertiary perfluoroamines, and perfluorocyclic ethers." The EPA believes that this final definition of fluorinated HTFs will ensure that all fluorinated HTFs used in electronics manufacturing and susceptible to being emitted in the atmosphere are appropriately monitored and reported under subpart I, and that the EPA will receive valuable emissions information on the full range of volatile fluorinated HTFs used in electronics manufacturing.

While the EPA agrees that it is appropriate to modify the definition of fluorinated HTFs in subpart I to explicitly exclude, lubricants (such as greases and oils), and surfactants, the EPA does not agree with the commenter's suggestion to modify both the definition of fluorinated HTFs and the definition of fluorinated GHGs in 40 CFR part 98, subpart A. Making changes to

the general definition of fluorinated GHGs in 40 CFR part 98, subpart A for purposes of subpart I only is not appropriate, because this definition applies to multiple other subparts. Further, such a modification is outside the scope of this rulemaking because the EPA did not propose any changes to the definition of fluorinated GHGs. However, the Agency notes that many of the chemicals for which exemptions were requested are likely excluded from Part 98 because they are used in applications that fall outside the definition of fluorinated heat transfer fluid. Moreover, the definition of fluorinated GHG retains the 1 mm Hg at 25 °C vapor pressure limit and these chemicals generally have a vapor pressure below that limit.

The EPA also does not agree with the suggestion to remove the clause, "device testing, cleaning substrate surfaces and other parts, and soldering," from the definition. All of these applications were included in the December 1, 2010 final rule (75 FR 74775). In the proposed rule, the EPA did not intend to modify the set of applications included in the definition of fluorinated HTFs, but rather to clarify the definition to cover all fluorocarbons (except for ozone depleting substances regulated under the EPA's Stratospheric Protection Regulations at 40 CFR part 82) that can enter the atmosphere under the conditions in which fluorinated HTFs are used in the electronics manufacturing industry.

Similarly, the EPA is not revising the definition of fluorinated HTFs to limit it to substances used "solely or primarily to transfer heat by radiation, conduction, convection or a combination of these methods." This definition would not include all of the applications in electronics manufacturing in which fluorocarbons are used at high temperatures and can therefore enter the atmosphere. The EPA believes that by explicitly excluding certain items from the definition we can address the commenter's primary concerns without restructuring the definition.

Burden

Comment: One commenter expressed concern that unless the EPA made its recommended changes (i.e., modifications to the scope of Part 98 to explicitly exclude certain substances and related provisions), the burden associated with the monitoring, reporting, recordkeeping, and quality assurance and quality control (QA/QC) requirements under subpart I would be unjustified (40 CFR 98.92(a)(6), 98.93(s), 98.94(h), and 98.96(g)). The commenter expressed the opinion that materials covered by the HTF provisions are expected to generate insignificant emissions.

Response: With respect to the commenter's concern about the burden associated with modifying the fluorinated HTF definition, the only change in burden relative to the current subpart I

requirements is associated with the inclusion of fluorinated HTFs whose vapor pressures fall below 1 mm Hg absolute at 25 °C. This action aligns the reporting requirements with the EPA's original intention to include all fluorocarbons that can enter the atmosphere under the conditions in which fluorinated HTFs are used in the electronics manufacturing industry. The set of applications included in the definition (temperature control, device testing, cleaning substrate surfaces and other parts, and soldering in certain types of electronics manufacturing production processes) is the same as in the December 1, 2010 final rule. As the EPA stated in the preamble of the proposed rule, the EPA's burden estimates for the December 2010 final rule were based on reporting of all fluorinated HTFs; therefore the clarifications in this final rule do not impose additional burden on reporters (76 FR 56010, September 9, 2011). In addition, in this final rule, the EPA has included flexibility provisions to reduce burden associated with monitoring and reporting of fluorinated HTF emissions.

The other comments that the commenter provided on burden (i.e., comments not directly related to the definition of fluorinated HTFs or the provisions to calculate and report them) are outside the scope of this rule as the EPA did not propose any changes to those sections.

#### Flexibility for Reported Fluorinated HTF Emissions



Comment: In response to the EPA's request for comment on whether reporters should be given flexibility under 40 CFR 98.93(h) to report either a chemical's emissions from all applications or its emissions from only the applications included in the HTF definition, one commenter asserted that flexibility is needed. The commenter advocated flexibility to reduce the burden associated with separately quantifying and tracking consumption due to miscellaneous non-HTF applications. The commenter stated that numerous materials used in semiconductor manufacturing may have non-HTF applications, and the burden of identifying and categorizing the different material would be significant.

Response: To provide flexibility, the EPA has finalized provisions to give facilities the option to avoid maintaining a separate supply of the chemical for purposes of tracking fluorinated HTF emissions, as would otherwise be required for the mass-balance calculation. Where a fluorinated chemical is used in both HTF and non-HTF applications, the EPA is revising provisions in 40 CFR 98.93(h)(1) to allow facilities to estimate and report emissions either from all applications or from only those covered in the definition of "fluorinated heat transfer fluids." The EPA concluded that this flexibility would result in a reduction of burden for all electronics manufacturing facilities. Further, as the EPA stated in the preamble to the

proposed rule, the EPA understands that emissions from the non-HTF applications would make up a small fraction of the total. To ensure that the EPA understands whether emissions reported are from all applications of a fluorinated chemical or only from applications specified in the definition of fluorinated HTFs, the EPA is requiring facilities to report which approach they took in estimating emissions (40 CFR 98.94(u)). The EPA has concluded that the burden associated with the data reporting requirement is minimal and is balanced by the flexibility provided.

#### Reporting Requirements for Newly Included Fluorinated HTFs

Comment: One commenter strongly supported EPA's proposal to apply the requirement to report newly included fluorinated HTFs (i.e., HTFs with a vapor pressure of less than 1 mm Hg absolute at 25 °C) to emissions that occur in 2012 and beyond, but not to 2011 emissions. The commenter asserted that because of the specific exclusion of these HTFs in the December 1, 2010, rule (75 FR 74774), many facilities may not have records available for 2011 to support reporting of emissions.

Response: In this final rule, the EPA is requiring facilities to begin to estimate and report emissions from newly-included fluorinated HTFs (that is, HTFs whose vapor pressures fall below 1 mm Hg absolute at 25 °C) for emissions that occur in 2012. For reporting year 2012, the EPA is allowing facilities

to select either the time-period of January 1, 2012 through December 31, 2012 or [INSERT THE DATE 30 DAYS AFTER THE DATE OF PUBLICATION OF THE FINAL RULE IN THE FEDERAL REGISTER] through December 31, 2012. The EPA has concluded that this flexibility will provide facilities sufficient time to comply with the revisions. To ensure that the EPA can ascertain the time period over which reported 2012 emissions occurred, the EPA is requiring that, for 2012 only, facilities report the date selected to begin accounting for the newly included fluorinated HTFs (40 CFR 98.94(v)). Beginning in 2013, facilities will be required to estimate and report emissions from the entire reporting year (e.g., January 1 through December 31).

#### Other Comments

Comment: One commenter observed that the definition of "fluorinated GHGs" proposed by the California Air Resources Board (CARB) in their proposed GHG reporting rule is consistent with the U.S. EPA definition. The commenter noted that the consistency will help minimize the burden associated with the various reporting requirements. The commenter further encouraged the EPA to work with CARB to establish a consistent definition of HTFs if and when CARB does require reporting of HTFs. Lastly, the commenter also suggested minor edits to the explanation of vapor phase soldering in order to make the EPA's statement from

the proposed preamble (September 9, 2011, 76 FR 56010) more technically accurate.

Response: The EPA acknowledges the commenter's suggestion for the EPA to work with CARB to maintain consistency in the definition of fluorinated HTFs. As the EPA stated in the preamble to the GHG Reporting Rule in 2009, "EPA is committed to working with State and regional programs to coordinate implementation of reporting programs, reduce burden on reporters, provide timely access to verified emissions data, establish mechanisms to efficiently share data, and harmonize data systems to the extent possible" (74 FR 56260, October 30, 2009). The EPA also appreciates the commenter's clarifications of the process of vapor phase soldering.

Comment: One commenter provided recommendations to address the burden of reporting obligations for fluorinated materials with de minimis emissions of GHGs. The commenter suggested that a de minimis threshold for reporting be adopted under subpart I, 40 CFR 98.92(a)(6), 98.93(c), 98.94(h), and 98.96(g), to reduce reporting burden for miscellaneous fluorinated materials. In addition, the commenter suggested that EPA modify subpart I to clarify that 98.92(a)(6) applies only to materials used in manufacturing processes and not for other purposes, such as the operation and maintenance of the facility (e.g., fluorinated

surfactant in anti-static floor finish) and facility infrastructure systems (e.g., refrigerants for HVAC).

Response: The comments related to the adoption of a de minimis threshold for specific consumption reporting requirements in subpart I that are not related to the definition of fluorinated HTFs (e.g., 40 CFR 98.92(a)(6), 98.93(c), 98.94(h), and 98.96(g)) are outside the scope of this rule because EPA did not propose any changes to those sections regarding reporting thresholds or suggest that a de minimis threshold would be adopted.<sup>1</sup>

With respect to the commenter's suggestion to limit the scope of 40 CFR 98.92(a)(6) to materials used in manufacturing processes and not for other purposes, such as the operation and maintenance of the facility and facility infrastructure systems, is also outside the scope of this rule. EPA did not propose to narrow the scope of reporting under subpart I. For this reason, EPA is not taking action at this time regarding the commenter's suggestion. However, in a separate future action, the Agency may consider whether a modification to this reporting requirement is appropriate.

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<sup>1</sup> On the topic of de minimis in general, EPA directs the commenter to the Final MRR where EPA determined that de minimis provisions were not necessary because they would compromise the quality and usefulness of the data collected (74 FR 56260, October 2009). For additional background on EPA's decisions to exclude de minimis provisions, please see response to comments in the preamble to the Final MRR (74 FR 56278-56279, October 30, 2009) and also "Reporting Methods for Small Emission Points (De Minimis Reporting)" (EPA-HQ-OAR-2008-0508-0048).

### **III. Economic Impacts of the Rule**

The amendments finalized in this action are intended to clarify the intent of EPA to include all fluorocarbons that can enter the atmosphere under the conditions in which fluorinated HTFs are used in the electronics manufacturing industry.

Overall, these revisions are not expected to have a significant effect on the economy and an economic impact analysis is not required.

### **IV. Statutory and Executive Order Review**

#### A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

This action is not a "significant regulatory action" under the terms of Executive Order 12866 (58 FR 51735, October 4, 1993) and is therefore not subject to review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011).

#### B. Paperwork Reduction Act

The final amendments to subpart I will carry out the agency's intent to require reporting of emissions of all fluorocarbons used as fluorinated HTFs in the electronics manufacturing industry. This was the intent of the subpart I reporting requirements for fluorinated HTFs finalized on December 1, 2010 (75 FR 74774), and this intent was reflected in the Information Collection Request (ICR) prepared during that

rulemaking. Thus, the final amendments will not increase the EPA or industry burden beyond that estimated in the ICR.

The Office of Management and Budget (OMB) has previously approved the information collection requirements contained in the existing regulations and 40 CFR part 98, subpart I (75 FR 74774, December 1, 2010), under the provisions of the Paperwork Reduction Act, 44 U.S.C. 3501 et seq. and has assigned OMB control number 2060-0650. The OMB control numbers for the EPA's regulations in 40 CFR are listed in 40 CFR part 9. Burden is defined at 5 CFR 1320.3(b).

An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

### C. Regulatory Flexibility Act (RFA)

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of this rule on small entities, small entity is defined as: (1) A small business as

defined by the Small Business Administration's (SBA) regulations at 13 CFR 121.201; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of today's final rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. The small entities directly regulated by this final rule are facilities included in NAICS codes for Semiconductor and Related Device Manufacturing (334413) and Other Computer Peripheral Equipment Manufacturing (334119). As shown in Tables 5-13 and 5-14 of the Economic Impact Analysis for the Mandatory Reporting of Greenhouse Gas Emissions Final Rule (74 FR 56260, October 30, 2009) available in docket number EPA-HQ-OAR-2008-0508, the average ratio of annualized reporting program costs to receipts of establishments owned by model small enterprises was less than 1 percent for industries presumed likely to have small businesses covered by the reporting program.

Further, the EPA has clarified its intent and revised specific provisions to reflect what must be reported. While these revisions expand the scope of fluorocarbons that must be



reported, EPA's burden estimates were based reporting of all fluorinated HTFs; therefore, the clarification of intent does not impose additional burden on reporters. We have therefore concluded that this action will not impose additional regulatory burden for all affected small entities.

D. Unfunded Mandates Reform Act (UMRA)

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), 2 U.S.C. 1531-1538, requires federal agencies, unless otherwise prohibited by law, to assess the effects of their regulatory actions on state, local, and tribal governments and the private sector. Federal agencies must also develop a plan to provide notice to small governments that might be significantly or uniquely affected by any regulatory requirements. The plan must enable officials of affected small governments to have meaningful and timely input in the development of EPA regulatory proposals with significant federal intergovernmental mandates and must inform, educate, and advise small governments on compliance with the regulatory requirements.

These final rule amendments do not contain a federal mandate that may result in expenditures of \$100 million or more for state, local, and tribal governments, in the aggregate, or the private sector in any one year. Thus, the proposed rule amendments were not subject to the requirements of section 202 and 205 of the UMRA. This rule is also not subject to the

requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments.

E. Executive Order 13132: Federalism

This action does not have federalism implications. It will not have substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. Few, if any, state or local government facilities would be affected by the provisions in this final rule. This regulation also does not limit the power of states or localities to collect GHG data and/or regulate GHG emissions. Thus, Executive Order 13132 does not apply to this action.

F. Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). During the finalization of subpart I, the EPA undertook the necessary steps to determine the impact of those rules on tribal entities and provided supporting documentation demonstrating the results of the agency's analyses. The rule amendments in this action do not impose any significant changes to the current reporting

requirements contained 40 CFR part 98, subpart I. Thus, Executive Order 13175 does not apply to this action.

G. Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks

EPA interprets Executive Order 13045 (62 FR 19885, April 23, 1997) as applying only to those regulatory actions that concern health or safety risks, such that the analysis required under section 5-501 of the Executive Order has the potential to influence the regulation. This action is not subject to Executive Order 13045 because it does not establish an environmental standard intended to mitigate health or safety risks.

H. Executive Order 13211: Actions that Significantly Affect Energy Supply, Distribution, or Use

This action is not subject to Executive Order 13211 (66 FR 28355, May 22, 2001), because it is not a significant regulatory action under Executive Order 12866.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (NTTAA), Public Law No. 104-113, 12(d) (15 U.S.C. 272 note) directs the EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g.,

materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs the EPA to provide Congress, through OMB, explanations when the agency decides not to use available and applicable voluntary consensus standards.

This final action does not involve technical standards. Therefore, the EPA did not consider the use of any voluntary consensus standards.

J. Executive Order 12898: Federal Actions to Address  
Environmental Justice in Minority Populations and Low-Income  
Populations

Executive Order 12898 (59 FR 7629, February 16, 1994) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

The EPA has determined that this action will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations. This rule does not affect the level of protection provided to

human health or the environment because it is a rule addressing information collection and reporting procedures.

K. Congressional Review Act

The Congressional Review Act, 5 U.S.C. 801 et seq., as added by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), generally provides that before a rule may take effect, the agency promulgating the rule must submit a rule report, which includes a copy of the rule, to each House of the Congress and to the Comptroller General of the United States. EPA will submit a report containing this rule and other required information to the U.S. Senate, the U.S. House of Representatives, and the Comptroller General of the U.S. A major rule cannot take effect until 60 days after it is published in the Federal Register. This action is not a "major rule" as defined by 5 U.S.C. 804(2). This rule will be effective on [INSERT THE DATE 30 DAYS AFTER THE DATE OF PUBLICATION OF THE FINAL RULE IN THE FEDERAL REGISTER].

**List of Subjects in 40 CFR Part 98**

Environmental protection, Administrative practice and procedure, Greenhouse gases, Incorporation by reference, Reporting and recordkeeping requirements.

Dated: February 10, 2012.

Lisa P. Jackson,  
Administrator.

For the reasons stated in the preamble, title 40, chapter I, of the Code of Federal Regulations is amended as follows:

**PART 98—[AMENDED]**

1. The authority citation for part 98 continues to read as follows:

Authority: 42 U.S.C. 7401-7671q.

**Subpart I—[Amended]**

2. Section 98.90 is amended by revising paragraph (a) (5) to read as follows:

§98.90 Definition of the source category.

\* \* \* \* \*

(a) \* \* \*

(5) Any electronics manufacturing production process in which fluorinated heat transfer fluids are used to cool process equipment, to control temperature during device testing, to clean substrate surfaces and other parts, and for soldering (e.g., vapor phase reflow).

3. Section 98.91 is amended by revising the definition of "δ" in Equation I-4 in paragraph (a) (4) to read as follows:

§98.91 Reporting threshold.

\* \* \* \* \*

(a) \* \* \*

(4) \* \* \*

δ = Factor accounting for fluorinated heat transfer fluid emissions, estimated as 10 percent of total annual production process emissions at a semiconductor facility. Set equal to 1.1 when Equation I-4 of this subpart is used to calculate total annual production process emissions from semiconductor manufacturing. Set equal to 1 when Equation I-4 of this subpart is used to calculate total annual production process emissions from MEMS, LCD, or PV manufacturing.

\* \* \* \* \*

4. Section 98.92 is amended by revising paragraph (a) introductory text and paragraph (a)(5) to read as follows:

§98.92 GHGs to report.

(a) You must report emissions of fluorinated GHGs (as defined in §98.6), N<sub>2</sub>O, and fluorinated heat transfer fluids (as defined in §98.98). The fluorinated GHGs and fluorinated heat transfer fluids that are emitted from electronics manufacturing production processes include, but are not limited to, those listed in Table I-2 to this subpart. You must individually report, as appropriate:

\* \* \* \* \*

(5) Emissions of fluorinated heat transfer fluids.

\* \* \* \* \*

5. Section 98.93 is amended by:

a. Revising paragraph (h) introductory text.

b. Revising the definition of "EH<sub>1</sub>" in Equation I-16 in paragraph (h).



c. Revising the definition of "i" in Equation I-16 in paragraph (h).

d. Adding paragraph (h) (1).

e. Adding paragraph (h) (2).

§98.93 Calculating GHG emissions.

\* \* \* \* \*

(h) If you use fluorinated heat transfer fluids, you must report the annual emissions of fluorinated heat transfer fluids using the mass balance approach described in Equation I-16 of this subpart.

\* \* \* \* \*

$EH_i$  = Emissions of fluorinated heat transfer fluid i,  
(metric tons/year).

\* \* \* \* \*

i = Fluorinated heat transfer fluid.

\* \* \* \* \*

(1) If you use a fluorinated chemical both as a fluorinated heat transfer fluid and in other applications, you may calculate and report either emissions from all applications or from only those specified in the definition of fluorinated heat transfer fluids in § 98.98.

(2) For the 2012 reporting year, you may calculate and report emissions of fluorinated heat transfer fluids whose vapor pressure falls below 1 mm Hg absolute at 25 °C either for the

time period January 1, 2012 through December 31, 2012 or for the time period [INSERT THE DATE 30 DAYS AFTER THE DATE OF PUBLICATION OF THE FINAL RULE IN THE FEDERAL REGISTER] through December 31, 2012. The term "reporting year" in Equation I-16 shall be interpreted to be consistent with the time period selected. In addition, for the 2012 reporting year  $I_{iB}$  is not required to be the same as the inventory at the end of 2011 if the inventory at the end of 2011 excluded fluorinated heat transfer fluids whose vapor pressure falls below 1 mm Hg absolute at 25 °C. Starting in the reporting year 2013, you must calculate and report emissions of all fluorinated heat transfer fluids for the entirety of the reporting year.

6. Section 98.94 is amended by revising paragraph (h) introductory text and paragraph (h)(3) to read as follows:

§98.94 Monitoring and QA/QC requirements.

\* \* \* \* \*

(h) You must adhere to the QA/QC procedures of this paragraph (h) when calculating annual gas consumption for each fluorinated GHG and  $N_2O$  used at your facility and emissions from the use of each fluorinated heat transfer fluid.

\* \* \* \* \*

(3) Ensure that the inventory at the beginning of one reporting year is identical to the inventory reported at the end of the previous reporting year. This requirement does not apply

to the end-of-the-year inventory of fluorinated heat transfer fluids in 2011 and the beginning-of-the-year inventory of the same in 2012.

\* \* \* \*

7. Section 98.95 is amended by revising paragraph (b) to read as follows:

§98.95 Procedures for estimating missing data.

\* \* \* \*

(b) If you use fluorinated heat transfer fluids at your facility and are missing data for one or more of the parameters in Equation I-16 of this subpart, you must estimate fluorinated heat transfer fluid emissions using the arithmetic average of the emission rates for the reporting year immediately preceding the period of missing data and the months immediately following the period of missing data. Alternatively, you may estimate missing information using records from the fluorinated heat transfer fluid supplier. You must document the method used and values used for all missing data values.

8. Section 98.96 is amended by:

- a. Revising paragraph (c) (4).
- b. Revising paragraph (r).
- c. Revising paragraph (s).
- d. Adding paragraph (u).
- e. Adding paragraph (v).

§98.96 Data reporting requirements.

\* \* \* \* \*

(c) \* \* \*

(4) Each fluorinated heat transfer fluid emitted as calculated in Equation 1-16 of this subpart.

\* \* \* \* \*

(r) For fluorinated heat transfer fluid emissions, inputs to the fluorinated heat transfer fluid mass balance equation, Equation I-16 of this subpart, for each fluorinated heat transfer fluid used.

(s) Where missing data procedures were used to estimate inputs into the fluorinated heat transfer fluid mass balance equation under §98.95(b), the number of times missing data procedures were followed in the reporting year, the method used to estimate the missing data, and the estimates of those data.

\* \* \* \* \*

(u) For each fluorinated heat transfer fluid used, whether the emission estimate includes emissions from all applications or from only the applications specified in the definition of fluorinated heat transfer fluids in §98.98.

(v) For reporting year 2012 only, the date on which you began monitoring emissions of fluorinated heat transfer fluids whose vapor pressure falls below 1 mm Hg absolute at 25 °C. This

is either January 1, 2012 or [INSERT THE DATE 30 DAYS AFTER THE DATE OF PUBLICATION OF THE FINAL RULE IN THE FEDERAL REGISTER].

9. Section 98.98 is amended by removing the definition of "Heat transfer fluids" and adding the definition of "Fluorinated heat transfer fluids" in alphabetical order to read as follows:

§98.98 Definitions.

\* \* \* \* \*

Fluorinated heat transfer fluids means fluorinated GHGs used for temperature control, device testing, cleaning substrate surfaces and other parts, and soldering in certain types of electronics manufacturing production processes. Fluorinated heat transfer fluids do not include fluorinated GHGs used as lubricants or surfactants. For fluorinated heat transfer fluids under this subpart I, the lower vapor pressure limit of 1 mm Hg in absolute at 25 °C in the definition of Fluorinated greenhouse gas in §98.6 shall not apply. Fluorinated heat transfer fluids used in the electronics manufacturing sector include, but are not limited to, perfluoropolyethers, perfluoroalkanes, perfluoroethers, tertiary perfluoroamines, and perfluorocyclic ethers.

\* \* \* \* \*

10. Table I-2 to Subpart I is revised to read as follows:

Table I-2 to Subpart I of Part 98—Examples of Fluorinated GHGs and Fluorinated Heat Transfer Fluids Used by the Electronics Industry

Product Type	Fluorinated GHGs and Fluorinated Heat Transfer Fluids Used During Manufacture
Electronics	$\text{CF}_4$ , $\text{C}_2\text{F}_6$ , $\text{C}_3\text{F}_8$ , $\text{c-C}_4\text{F}_8$ , $\text{c-C}_4\text{F}_8\text{O}$ , $\text{C}_4\text{F}_6$ , $\text{C}_5\text{F}_8$ , $\text{CHF}_3$ , $\text{CH}_2\text{F}_2$ , $\text{NF}_3$ , $\text{SF}_6$ , and fluorinated HTFs $(\text{CF}_3-(\text{O}-\text{CF}(\text{CF}_3)-\text{CF}_2)_n-(\text{O}-\text{CF}_2)_m-\text{O}-\text{CF}_3)$ , $\text{C}_n\text{F}_{2n+2}$ , $\text{C}_n\text{F}_{2n+1}(\text{O})\text{C}_m\text{F}_{2m+1}$ , $\text{C}_n\text{F}_{2n}\text{O}$ , $(\text{C}_n\text{F}_{2n+1})_{3N}$

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